DOCUMENT RESUME

ED 072 295 VT 018 796

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TITLE	An Assessment of Cognitive Behavior of Economically Disadvantaged Young Adults in North Mississippi.
INSTITUTION	Mississippi Univ., University. Center for Manpower Studies.
SPONS AGENCY	Manpower Administration (DOL), Washington, D.C.
PUB DATE	Jan 73
NOTE	25p.; Working Paper-1
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Academic Ability; *Cognitive Ability; *Disadvantaged Groups; Economically Disadvantaged; Intelligence Quotient; *Intelligence Tests; *Job Training; Literacy; *Predictive Ability (Testing); Test Interpretation; Tests; Test Selection; Tests of Significance; Test Validity
IDENTIFIERS	Langmuir Oral Direction Test; ODT; WAIS; Wechsler Adult Intelligence Scale

ABSTRACT

This study sought to determine the appropriateness of two conventional intelligence tests for assessing the ability of economically deprived young adults participating in job training programs by comparing their test results with those of the test standardization groups. The Wechsler Adult Intelligence Scale (WAIS), and the Langmuir Oral Direction Test (ODT), were administered to subjects on different days. An analysis of test findings revealed that two of the poverty samples, the Manpower and Vocational Training, were found to be homogeneous. They resembled the WAIS normative sample on means, standard deviations, and correlations, whereas the other group, the Neighborhood Youth Corps, differed significantly. Possible explanations for these discrepancies may be chronological age, sex, or race Evaluations of these factors were not conducted. The study does show conclusively however, that poverty status alone does not guarantee below-average scores on intelligence tests. (SN)

ED 072295

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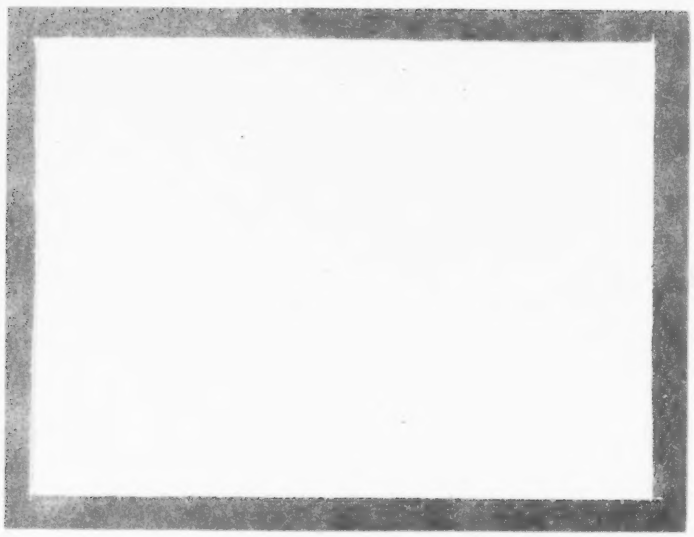

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Working Paper Number One

AN ASSESSMENT OF COGNITIVE BEHAVIOR OF ECONOMICALLY DISADVANTAGED YOUNG ADULTS IN NORTH MISSISSIPPI

by

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January, 1973

The material in this paper was prepared under Institutional Grant No. 31-45-70-03 from the Manpower Administration, U.S. Department of Labor, under the authority of title 1 of the Manpower Development and Training Act of 1962, as amended. Researchers undertaking such projects under Govenment sponsorship are encouraged to express freely their professional judgment. Therefore, points of view or opinions stated in this document do not necessarily represent the official position or policy of the Department of Labor. Moreover, the researchers are solely responsible for the factual accuracy of all material developed in the report.

Acknowledgements

The research was supported by a grant from the Center for Manpower Studies, University of Mississippi, U. S. Department of Labor Institutional Grant 31-45-70-03.

The authors wish to thank Michel Caldwell, Department of Psychology, The University of Mississippi, for valuable assistance in data processing. They also wish to thank Larry K. Otis, Director; William W. Jaggers, Assistant Director; and Wiley Woods, Adult Education Supervisor, the Vocational and Technical Education Center of the Itawamba Junior College, Tupelo Branch, whose cooperation made the study possible.

Predictors of training levels and job success levels for economically disadvantaged populations have become increasingly concerned about psychological research due to the initiation of a sizeable work-training programs supported by the federal government. The appropriateness of prominent conventional tests of cognitive function for making or contributing substantially to such predictions is controversial as disadvantaged people were not adequately represented in the tests' standardization populations. While a sizeable body of data suggests a positive relationship between performance on conventional tests and socioeconomic level (Tyler, 1965; Anastasi, 1968), numerous other variables that may confound it have been studies, e.g., ethnic status (Dreger and Miller, 1960, 1968), geographical residence, educational status, and caste status (Freeberg, 1970; Karp and Siegel, 1965; Tyler, 1968). Attempts to predict probability of job success among the disadvantaged have used one of three strategies: (a) the development of new "culture free" tests (Eels, Davis, Havighurst, Herrick and Tyler, 1951); (b) the design of new instruments along nonconventional lines for specific disadvantaged populations (Freeberg, 1970); or (c) the empirical evaluation of the appropriateness of selected, conventional, cognitive tests for specified disadvantaged populations (Cleary and Hilton, 1968; Cull and Hardy, 1971; Goldstein, 1967; Levinson, 1964; Lopez, 1966).

The present study followed the last strategy; it investigated the appropriateness of two conventional tests of intellectual function for assessing economically disadvantaged young adults in North Mississippi by comparing their test results with those of the test standardization groups and by describing the psychometric characteristics of the target populations. Three main hypotheses were made: (a) that poverty-level trainees in work-training programs in North Mississippi would score below normative populations on the selected tests and sub-tests; (b) that the poverty-level trainees would differ from the normative populations on factor patterns; and (c) that at least some sub-tests would provide good leads for the development of a short and valid instrument for screening the disadvantaged. As results accumulated, it appeared that the poverty-level trainees from the three training programs discussed below might not be homogenous. So an additional aspect of the study became that of investigating the within poverty-group characteristics.

Method

Subjects. Subjects for the study were young adults who were participating in vocational and technical training programs for upgrading educational levels and vocational skills. Most of them were enrolled in one of three programs offered at the Vocational and Technical Education Center of the Itawamba Junior College, Tupelo, Mississippi, branch. A few came from an Oxford location.

All programs were designed and operated to enable trainees to secure either initial employment or more suitable employment.[1]

Criteria for inclusion in the population sample for this study were as follows: (a) poverty level incomes as specified by OEO Income Poverty Guidelines (1970, p.2); (b) chronological ages between 16 and 34 years; and (c) informed willingness to participate. The research design called for matching qualified subjects as closely as possible across the three training programs on chronological age (CA), sex, and color. Such matching was only partially possible, however, because of the different compositions of the three programs. All subjects who fit the criteria were included in the samples, except for two (in Manpower) who elected not to participate.

Procedure. The Wechsler Adult Intelligence Scale (WAIS) and the Langmuir Oral Direction Test (ODT), form S, were the instruments used. The WAIS (Wechsler, 1955) was selected because of its wide and accepted use for evaluation and prediction in

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[1]The three programs from which the sample populations were drawn and their qualifications for admission follow: (1) The Manpower program admits people who are 18 years old or older, who are dependent on themselves for earning a living, and who are either underemployed or unemployed; (2) the Vocational Training program admits anyone who is 16 years old or older and who meets the educational requirement of the particular vocational training area he wishes to enter; and (3) the Neighborhood Youth Corps (NYC) program accepts individuals who are 16-19 years old, who are economically disadvantaged (below the OEO poverty level), and who have not graduated from high school.

vocational rehabilitation settings.[2] The ODT (Langmuir, 1954) was selected because of its development for use in industrial settings, its short administration time, and its group-administration capability.[3]

Ss were tested on the WAIS and ODT on different days and in a balanced order. Three skilled examiners served as administrators. The ODT was given in small groups (average size=5); the WAIS, individually, as standardized.

Results

The three target groups were first tested for homogeneity. Comparisons (by t tests, one-tailed) of the means of all tests and subtests indicated no significant differences (at .025 level or better) between the Manpower and the Vocational Training groups. In sharp contrast, however, all comparisons between Manpower and NYC means, except Object Assembly, yielded significant differences ($p = .025$ to $.005$); all comparisons between the Vocational Training and NYC means except for Digit Span, Digit Symbol and Picture Arrangement, also yielded significant differences. Consequently, for all further statistical

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[2]The WAIS is an individually administered test that consists of 11 subtests divided into a Verbal Scale and Performance Scale. Scores are determinable for each subtest and for the Verbal and Performance Scales separately and combined into Full Scale. No reading is required.

[3]Directions for the ODT are verbal and taped by the publisher for uniform administration. Ss respond to the directions by marking answer sheets. Recognition of numbers 1 to 25 is required; reading letters and words is not.

treatment, the Manpower and Vocational Training groups were combined and, hereafter, will be designated as the MVT group.

Table 1 shows the composition of the subject groups by program. It may be seen that the MVT and NYC groups differed in CA range, sex, and color. The entire poverty sample numbered 42, ranged in CA from 16-34 years, and included more females and blacks than males and whites.

Table 2 gives the means and standard deviations across training programs for the WAIS Full Scale, Verbal Scale, and Performance Scale IQs, for WAIS subtest scaled-scores, and for ODT raw scores. The MVT group significantly exceeded the NYC group on all comparisons of mean scores (t tests, one-tailed: $p = .025$ to .005). Comparisons by variances of all tests also indicated significant difference ($p = .01$) between the MVY and NYC groups on Comprehension, Performance Scale IQ, and Full Scale IQ. The mean WAIS IQ levels of NYC were 15.71, 15.82, and 13.54 points below MVT on Full Scale, Verbal Scale, and Performance Scale, respectively.

Because of the restrictions of the samples, a nonparametric procedure, the Median Test for two independent samples, was run (Siegel, 1956). Again, there were differences between the two poverty groups: eight of the 12 comparisons were significant at the .01 to .0005 levels. The remaining four reached significance levels of .10 to .15.

Table 1

Composition of Subject Groups
By Program

Program	N	C.A.		Sex		Color	
		M	Range	M	F	B	W
Manpower and Vocational Training	29	23.93	17-34	14	15	4	25
Neighborhood Youth Corps	13	17.01	16-24	2	11	13	0
All Combined	42	21.81	16-34	16	26	17	25

Table 2

Mean Scores on Each Test by Program

Test	Program: Manpower & Vocational Training M	Manpower & Vocational Training SD	NYC M	NYC SD
WAIS				
Information	8.31	2.11	5.23	1.88
Comprehension	9.72	2.58	5.15	1.07
Arithmetic	9.76	3.07	6.62	2.29
Similarities	10.07	2.36	6.62	2.57
Digit Span	10.17	3.19	7.92	2.62
Vocabulary	8.83	2.36	4.85	1.68
Digit Symbol	10.17	2.95	8.15	1.77
Picture Completion	8.72	2.31	6.15	1.34
Block Design	9.38	2.48	6.77	1.59
Picture Arrangement	9.03	2.28	7.62	1.93
Object Assembly	9.93	3.07	7.85	2.93
Full IQ	97.17	11.68	81.46	5.19
Verbal IQ	97.51	12.14	81.69	8.20
Performance IQ	97.23	12.22	83.69	4.92
ODT	30.59	5.75	20.85	5.64

Note: *t* tests (one-tailed) computed between means on all tests. All comparisons between NYC and MVT yielded significant differences ($p = .025$ to $.005$).

F tests (one-tailed) computed between variance of all tests. Only significant differences ($p = .01$) found were Comprehension, Full IQ, and Performance IQ.

Comparisons of the two poverty programs with the WAIS normative sample for CA 18-34 combined (N=500) (Wechsler, 1955, p. 15-16) revealed no significant differences between the MVT and WAIS normative group except on Comprehension (p=.005) and Picture Completion (p=.025). However, the NYC group differed significantly from the WAIS normative sample on all subtests (p= .025 to .005).

The foregoing comparisons, therefore, substantiated our first hypothesis in the case of the NYC poverty group but not in the case of the MVT poverty group. NYC acted independently of, and inferior to, both the MVT poverty group and the WAIS normative group.

Pearson intercorrelations of tests and subtest scores are presented in Table 4 and Table 5 for the MVT and NYC programs, respectively. The MVT matrix is substantially similar to that of the WAIS normative groups of similar chronological ages (Wechsler, 1955, 15-16). All correlations were positive but one. Correlations of MVT's Verbal and Performance IQ with Full Scale IQ (.94 and .91, respectively) were substantially similar to WAIS normative correlations (.95 to .96 and .93 to .92). Highest subtest predictors of Verbal IQ were Vocabulary (.91) and Information (.84).

The NYC correlation matrix, on the other hand, resembled that of the MVT and the WAIS standardization groups in some respects but contrasted with them in other respects. The areas of similarity for all three groups of subjects follow: the highest predictor of Full Scale IQ was Verbal Scale IQ; the

Table 3

Median Test for 2 Independent Samples[a]
Manpower and Vocational Trainees vs. NYC

Variables	X^2 Value	Level of Significance
WAIS		
Information	7.13	.005
Comprehension	19.70	.0005
Arithmetic	6.47	.01
Similarities	11.14	.0005
Digit Span	1.44	.15
Vocabulary	11.14	.0005
Digit Symbol	1.44	.15
Picture Completion	7.13	.005
+ Block Design	4.01	.025
Picture Arrangement	1.21	.15
Object Assembly	1.69	.10
ODT	12.59	.0005

a. cited by Siegel, S. (1956).

Table 4

Correlation Matrix for Manpower and Vocational (MVT)
Training Programs Combined

WAIS	Information	Comprehension	Arithmetic	Similarities	Digit Span	Vocabulary	Digit Symbol	Picture Completion	Block Design	Picture Arrangement	Object Assembly	Verbal IQ	Performance IQ	Full Scale IQ
Comprehension	.61													
Arithmetic	.59	.25												
Similarities	.62	.42	.42											
Digit Span	.48	.15	.48	.42										
Vocabulary	.75	.71	.58	.72	.53									
Digit Symbol	.17	.06	.21	.26	.50	.31								
Picture C.	.55	.37	.37	.40	.58	.45	.24							
Block Design	.43	-.12	.49	.35	.34	.23	.29	.19						
Picture A.	.54	.29	.41	.51	.64	.55	.33	.53	.33					
Object A.	.38	.16	.29	.45	.21	.31	.38	.13	.50	.14				
Verbal IQ	.84	.63	.72	.80	.69	.91	.39	.58	.41	.64	.41			
Perform. IQ	.62	.20	.57	.60	.69	.55	.61	.60	.68	.66	.69	.73		
Full Scale IQ	.73	.47	.71	.75	.74	.80	.54	.63	.58	.69	.56	.94	.91	
Oral Dir. Test	.67	.38	.51	.55	.56	.59	.46	.47	.43	.52	.32	.74	.64	.76

Table 5

Correlation Matrix for Neighborhood Youth Corps Program (NYC)

TEST	Information	Comprehension	Arithmetic	Similarities	Digit Span	Vocabulary	Digit Symbol	Picture Completion	Block Design	Picture Arrangement	Object Assembly	Verbal IQ	Performance IQ	Full Scale IQ
WAIS														
Comprehension	.77													
Arithmetic	.47	.50												
Similarities	.54	.24	.37											
Digit Span	.17	.30	.40	.24										
Vocabulary	.67	.57	.55	.30	.15									
Digit Symbol	.54	.43	.28	.36	.47	.65								
Picture C.	.15	-.02	.46	.02	-.18	.27	-.13							
Block Design	-.32	-.47	-.07	.24	-.50	-.17	-.23	.41						
Picture A.	.16	.31	.22	-.18	-.12	.33	.04	-.04	-.24					
Object A.	-.58	-.31	-.44	-.53	-.54	-.41	-.62	.05	.44	-.23				
Verbal IQ	.78	.73	.73	.71	.53*	.72	.62	.12	-.21	.19	-.68			
Perform. IQ	-.13	-.05	.03	-.22	-.57	.25	-.14	.41	.64	.34	.55	-.15		
Full Scale IQ	.66	.68	.72	.58	.26	.80	.54	.31	.08	.33	-.39	.89	.32	
Oral Dir. Test	.63	.50	.47	.40	.07	.57	.49	-.12	-.30	.63	-.63	.62	-.04	.57

highest subtest predictor of Full Scale IQ was the Vocabulary test; intercorrelation of the verbal subtests of the WAIS were all positive, correlations of the Oral Directions Test with WAIS verbal tests were positive.

The areas in which the correlation matrix of NYC sharply differed from those of the MVT and the WAIS standardization groups were as follows: NYC's frequent negative correlations involving subtests in the Performance Scale of WAIS; NYC's low correlations between Performance and Verbal Scale IQ and between Full Scale and Performance IQ; NYC's negative ODT correlations with four of the five WAIS Performance subtests.

A Comrey (1967) Criterion I rotation was used for the factor analyses. Factor loadings of the WAIS subtests and ODT are given in Table 6 for the WAIS standardization population, the MVT group, and the NYC group. Factor loadings for the WAIS normative group were obtained by extracting and rotating three factors; data used for the analysis were the average of the correlations given by Wechsler (1955, p. 15-16) for his standardization groups (CA 18-19 and 25-34). A first factor resulted which accounted for 56 percent of the variance for the WAIS normative group, 43 percent for the MVT, and 37 percent for the NYC group. When the ODT test was included for both the MVT and NYC groups, it was also found to load heavily on this factor. Second and third factors accounted for substantially smaller percentages of the variances across groups with the two poverty groups

Table 6

Factor Loadings by Program[a]

	WAIS Norms[b] (N=500)			MVT (N=29)			NYC (N=13)		
	Factors			Factors			Factors		
Variables	I	II	III	I	II	III	I	II	III
Information	0.882	0.153	-0.092	0.834	0.293	-0.025	0.847	0.106	0.016
Comprehension	0.742	0.132	-0.182	0.461	0.604	-0.425	0.711	-0.117	-0.152
Arithmetic	0.716	0.133	0.110	0.655	0.017	0.122	0.635	0.226	0.111
Similarities	0.801	0.153	-0.081	0.724	0.22	0.075	0.488	0.233	0.357
Digit Span	0.619	0.168	0.250	0.713	-0.389	-0.138	0.411	-0.485	0.323
Vocabulary	0.861	0.228	-0.106	0.822	0.342	-0.189	0.754	0.209	-0.095
Digit Symbol	0.689	0.034	0.089	0.445	-0.235	0.155	0.691	-0.197	0.136
Picture C.	0.760	-0.229	-0.108	0.619	-0.125	-0.275	0.066	-0.606	0.191
Block Design	0.738	-0.378	0.069	0.484	-0.122	0.554	-0.358	0.730	0.230
Picture A.	0.723	-0.180	-0.022	0.700	-0.202	-0.191	0.289	0.093	-0.791
Object A.	0.646	-0.420	0.071	0.426	0.182	0.475	-0.748	0.194	-0.093
ODT				0.785	-0.026	0.047	0.749	0.109	-0.418
% Variance[c]	55.91	5.2	1.5	42.9	7.7	7.7	36.8	11.7	10.0

[a]Comrey Criterion I rotation (Comrey, 1967)

[b]Obtained by extracting and rotating 3 factors using the average of the correlations given by Wechsler (1955,p.15-16) for his standardization groups of CA 18-19 and 25-34.

[c]Excludes ODT in the WAIS norms.

showing less sharp drops from the first factor. The WAIS normative group and the MVT poverty group loaded substantially on Factor I on all WAIS subtests. The NYC group, however, showed negative first-factor loadings on Object Assembly and Block Design and a large positive Block Design loading on the second factor. Relatively large negative loadings were also found for NYC on the ODT and the Picture Assembly tasks on a third factor. These loadings were not found for the MVT group. Quite clearly, the NYC group was different from both the MVT poverty group and the WAIS normative group on subtest factor patterns. The substantial drop in the value of the first factor loadings for the Block Design and Object Assembly tasks in the poverty groups would seem to indicate that poverty per se might affect performance on these two tasks.

Discussion

Means and variances. The findings of the present study indicate that poverty status as defined by OEO does not guarantee below-average intelligence test scores for the North Mississippi populations studied. The means for the MVT group were well within the published norms. Moreover, since all Ss were below the OEO poverty line, economic disadvantages alone could probably not account for the differences found between the NYC group and the MVT group.

Three demographic differences were observed between the NYC and MVT groups which could be associated with the differences in performance on the WAIS and ODT. The groups differed along

the dimensions of CA, sex, and color. While the present study cannot determine which of these (or some yet unknown variable) may be involved in the results obtained, other studies in the literature are relevant.

Age. Data reported by Wechsler (1955, p. 18-19) for the WAIS standardization groups by age indicated homogeneity of variance for the seven CA groups presented. Publication at a later date of breakdown of the scores into 11 CA groups showed essentially similar means and variances across ages except for the CA 25-29 range, at which level the scores peaked slightly (Wechsler, 1958, p. 95).

Results of studies of the effect of chronological age on the factorial organization of WAIS subtest have been inconsistent. The prototype of a number of these studies is the one done by Cohen (1958) on the WAIS normative population divided into four CA ranges: 18-19, 25-34, 45-54, and 60-75. Cohen found remarkable consistency in the factor loading across the first three age groups. These findings are interpreted to mean that the CA differences across the programs of the present study would probably not have accounted for the obtained differences between them.

Sex. Since the NYC and MVT groups differed in the proportion of males and females, sex may be viewed as a possible correlate of the obtained group-differences. Wechsler's data on sex differences by CA and by subtests showed no significant differences

for the CA's common to the present study (Wechsler, 1958, p. 146). Of particular interest are Block Design and Object Assembly, on which the NYC group performed atypically. Only when all CA groups were combined by Wechsler (CA 16-64) did sex difference in Block Design reach a critical ratio of 2.75. Object Assembly difference remained insignificant, with a critical ratio of .47 (Wechsler, 1958, 147). Sex differences, then, do not appear to be an alternative explanation for the discrepancies between the NYC and the MVT groups.

Race. Finally, race or color effects may offer an alternate explanation for the differences in performance across the poverty groups, since all members of NYC were black and most of the members of MVT were white. Racial differences in levels of performance on current tests of intellectual function are well documented; the reader is referred to the many reviews available (Dreger and Miller, 1965, 1968; Freeberg, 1970; Tyler, 1965; Anastasi, 1968). The NYC IQ levels on the WAIS were substantially similar to the mean Stanford-Binet IQs of Southeastern Negroes found by Kennedy, et al., for younger Ss (1963). Variables crucial to such differences, however, have not been established.

Factor patterns. Because of the small n in the NYC sample, differences in factor patterns between that group and the other groups could well have occurred by chance. Nevertheless, since some of the findings parallel those observed in other studies, some guarded speculations about the differences may be warranted.

Note should be made of the similarity of the factor loadings that occurred in the present study to those reported by Wechsler (1958, p. 122), whose first factor accounted for 52.7 percent and 50 percent of the variance for CA 18-19 and CA 25-34, respectively, with sharp drop-offs for the remaining factors. In the present study Factor I accounted for 56 percent, 43 percent and 37 percent of the variance for the WAIS normative population, the MVT group, and the NYC group, respectively.

The differences between the NYC group and the other two groups occurred largely in the Performance Scale and especially in Factor I for the Object Assembly and Block Design subtests. According to Wechsler (1958, p. 124), these two tests have been found to load most consistently in a visualization, or visual-motor, or non-verbal organizational factor. Wechsler (p. 134) noted, in addition, that the Object Assembly test "runs with the hares and hunts with the hounds", i.e., it correlates systematically low with g and with all subtests. Wechsler also reported (p.134) that "Block Design, next to Object Assembly, loads most consistently on the Non-Verbal Organizational factor. It differs from Object Assembly by the fact that it has a much higher saturation in g."

Levinson (1963) found that a population of homeless whites scored significantly higher than a group of native-born Negroes on all WAIS subtests but Object Assembly and Picture Arrangement. The psychometric patterns in his study, however, were quite similar.

Extension and amplification of factor-pattern studies may lead to new hypotheses as to what really counts that is related to race.

Practical Implications. Practical implications for screening Ss for the programs included in the present study are several. The WAIS Verbal Scale appears, by internal consistency criteria, to do about as good a job as the Full Scale (.89 for NYC and .94 for MVT). The highest subtest predictors of Verbal Scale and Full Scale were the Information and Vocabulary subtests. The ODT, requiring only 15 minutes for administration and a minimum of administrative skills, appears to be a promising instrument for screening candidates for the vocational settings studied herein.

Summary

This pilot study was concerned with cognitive function of 42 economically deprived (below OEO poverty levels) young adults in North Mississippi who were participating in three training programs to upgrade their employability. The aims of the study were to determine for two standardized tests, the Wechsler Adult Intelligence Scale (WAIS), and the Langmuir Oral Directions Test (ODT), levels and patterns of response that might be useful in understanding and screening these individuals for training programs. Two of the three poverty samples (the Manpower and Vocational Training, MVT) were found to be homogeneous and were, therefore, combined for all further comparisons with the Neighborhood Youth Corps (NYC).

The main finding was that poverty alone did not guarantee below-average scores on the tests used. The MVT group closely resembled the WAIS normative sample on means, standard deviations, and correlations. The NYC group, however, differed significantly from both the WAIS normative sample and the MVT group on those measures; decrements occurred across the board. The NYC group also differed from the WAIS and MVT groups in factor patterns. There was some suggestion, however, that poverty per se may effect performance on Block Design and Object Assembly.

Possible explanations of the performance discrepancies between the NYC and MVT groups included consideration of the differences between them in CA, sex, and race. The present study did not facilitate evaluations of these effects.

The highest predictor across samples of WAIS Full Scale IQ was Verbal Scale IQ. The highest predictors of Verbal Scale IQ were the Information and Vocabulary subtests. The ODT, correlating substantially with verbal tests and loading heavily on the first factor, appears to be a good prospect for a short and easily administered screening instrument for poverty populations in vocational training settings of the sorts herein studied.

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